PART K
HEARING CONSERVATION

WAC

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WAC 296-62-09015 Hearing conservation.

Note: The requirements in WAC 296-62-09015 through 296-62-09055 apply only to agriculture. The requirements for all other industries relating to noise have been moved to chapter 296-817 WAC, Hearing loss prevention (noise).

The employer shall administer a continuing effective hearing conservation program, as described in WAC 296-62-09015 through 296-62-09055 whenever employee noise exposures equal or exceed an 8-hour time-weighted average (TWA) sound level of 85 decibels (dB) measured on the A-scale weighting at slow response or, equivalently, a noise dose of fifty percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with WAC 296-62-09055, Appendix E: Noise exposure computation, without regard to any attenuation provided by the use of personal protective equipment.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 03-11-060 (Order 02-16), § 296-62-09015, filed 05/19/03, effective 08/01/03. Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09015, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09015, filed 1/15/82.]

WAC 296-62-09017 Definitions. These definitions apply to the following terms as used in WAC 296-62-09015 through 296-62-09055.

(1) **Audiogram** - A chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.

(2) **Audiologist** - A professional, specializing in the study and rehabilitation of hearing, who is certified by the American Speech, Hearing, and Language Association or licensed by a state board of examiners.

(3) **Baseline audiogram** - The audiogram against which future audiograms are compared.

(4) **Criterion sound level** - A sound level of 90 decibels.

(5) **Decibel (dB)** - Unit of measurement of sound level.

(6) **Hertz (Hz)** - Unit of measurement of frequency, numerically equal to cycles per second.

WAC 296-62-09017 (Cont.)

(7) **Impulsive or impact noise** - Noise levels which involve maxima at intervals greater than one second. Where the intervals are less than one second, the noise levels shall be considered continuous.

(8) **Medical pathology** - A disorder or disease. For purposes of this regulation, a condition or disease affecting the ear, which should be treated by a physician specialist.

(9) **Noise dose** - The ratio, expressed as a percentage, of (a) the time integral, over a stated time or event, of the 0.6 power of the measured slow exponential time-averaged, squared A-weighted sound pressure and (b) the product of the criterion duration (8 hours) and the 0.6 power of the squared sound pressure corresponding to the criterion sound level (90 dB).

(10) **Noise dosimeter** - An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.

(11) **Otolaryngologist** - A physician specializing in diagnosis and treatment of disorders of the ear, nose and throat.

(12) **Representative exposure** - Measurements of an employee's noise dose or 8-hour time-weighted average sound level that the employer deems to be representative of the exposure of other employees in the workplace.

(13) **Standard threshold shift** - A hearing level change, relative to the baseline audiogram, of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

(14) **Sound level** - Ten times the common logarithm of the ratio of the the square of the measured A-weighted sound pressure to the square of the standard reference pressure of 20 micropascals. Unit: Decibels (dB). For use with this regulation, slow time response, in accordance with ANSI S1.4-1971 (R1976), is required unless specifically specified otherwise.

(15) **Sound level meter** - An instrument for the measurement of sound level.

(16) **Time-weighted average sound level** - That sound level, which if constant over an 8-hour period, would result in the same noise dose as if measured in the time varying noise level environment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09017, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09017, filed 1/15/82.]

WAC 296-62-09019 Monitoring.

(1) When reasonable information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 dBA, the employer shall obtain individual or representative exposure measurements for all employees who may be exposed at or above that level.

(2) The sampling strategy shall be designed to identify all employees required to be included in the hearing conservation program and to enable the proper selection of hearing protectors.

(3) Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise exist, the employer shall use representative personal sampling to comply with the monitoring requirements of this section unless the employer can establish that area sampling produces equivalent results.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09019, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09019, filed 1/15/82.]

WAC 296-62-09021 Method of noise measurement.

(1) Noise dosimeters which comply, as a minimum, with the provisions of subdivision (1)(a) of this section or sound level meters which comply, as a minimum, with the provisions of subdivision (1)(b) of this section shall be used whenever employee exposures are evaluated for the purpose of complying with WAC 296-62-09015 through 296-62-09055.

(a) Dosimeters. Dosimeters shall meet the Class 2A-90/80-5 requirements of the American National Standard Specification for Personal Noise Dosimeters, S1.25-1978.

(b) Sound level meters. Sound level meters shall meet the Type 2 requirements of the American National Standard Specification for Sound Level Meters, S1.4-1971 (R1976).

(2) All continuous, intermittent, and impulsive sound levels from 80 dBA to 130 dBA shall be integrated into the exposure computation.

(3) Monitoring shall be repeated whenever a change in production, process, equipment or controls increases noise exposures to the extent that:

(a) Additional employees may be exposed at or above an 8-hour time-weighted average of 85 dBA; or

(b) The attenuation provided by hearing protectors being used by employees may be rendered inadequate to meet the requirements of WAC 296-62-09033.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09021, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09021, filed 1/15/82.]

WAC 296-62-09023 Calibration of monitoring equipment. Dosimeters and sound level meters used to monitor employee noise exposure shall be calibrated using the instrument manufacturer's calibration instructions before and after each day's use.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09023, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09023, filed 1/15/82.]

WAC 296-62-09024 Employee notification. The employer shall notify each employee exposed at or above an 8-hour time-weighted average of 85 dBA of the results of the monitoring.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09024, filed 11/30/83.]

WAC 296-62-09025 Observation of monitoring. The employer shall provide affected employees or their representatives with an opportunity to observe any measurements of employee noise exposure which are conducted pursuant to WAC 296-62-09019.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), 296-62-09025, filed 1/15/82.]

WAC 296-62-09026 Noise control.

(1) Whenever employee noise exposures equal or exceed an 8-hour time-weighted average of 90 dBA, feasible administrative or engineering controls shall be utilized.

(2) Upon request, the employer shall prepare and submit a written compliance plan to the director or his/her designee. This plan must include a description of the manner in which compliance will be achieved with respect to cited violations of WAC 296-62-09026(1) and shall include proposed abatement methods, anticipated completion dates, and provision for progress reports to the director or his/her designee.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09026, filed 11/30/83.]

WAC 296-62-09027 Audiometric testing program.

(1) The employer shall establish and maintain a mandatory audiometric testing program as provided in this section for all employees whose exposures equal or exceed an 8-hour time-weighted average of 85 dBA.

(2) The program shall be provided at no cost to employees.

(3) Audiometric tests shall be performed by a licensed or certified audiologist, otolaryngologist, or other qualified physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or other qualified physician.

(4) All audiograms obtained pursuant to this section shall meet the requirements of WAC 296-62-09047, Appendix A: Audiometric measuring instruments.

(5) **Baseline audiogram.**

(a) Prior to or within 180 days after an employee's first exposure to noise at or above a time-weighted average of 85 dBA, the employer shall establish for each employee so exposed a valid baseline audiogram against which subsequent audiograms can be compared. Employers who utilize mobile test units are allowed up to one year to obtain a valid baseline audiogram for each exposed employee, provided that each employee so exposed shall be trained and shall wear suitable hearing protectors in accordance with WAC 296-62-09015 through 296-62-09055.

(b) Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise.

This may be accomplished by use of hearing protectors; however, the employer shall notify employees of the need to avoid high levels of nonoccupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

(6) **Annual audiogram.**

(a) At least annually (i.e. every 12-month interval) after obtaining the baseline audiogram, the employer shall obtain a new audiogram for each employee exposed at or above a time-weighted average of 85 dBA.

(b) Annual audiometric testing may be conducted at any time during the workshift.

(7) **Evaluation of audiogram.**

(a) Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if a standard threshold shift has occurred. This comparison may be made by a certified audiometric technician.

(b) If the annual audiogram indicates that an employee has suffered a standard threshold shift, the employer may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.

(c) An audiologist, otolaryngologist or other qualified physician shall review audiograms which indicate a standard threshold shift to determine whether there is need for further evaluation. The employer shall provide to the person performing this evaluation the following information:

WAC 296-62-09027 (Cont.)

(i) A copy of the requirements for hearing conservation as set forth in WAC 296-62-09015 through 296-62-09055;

(ii) The baseline audiogram and most recent audiogram of the employee to be evaluated;

(iii) Measurements of background sound pressure levels in the audiometric test room as required in WAC 296-62-09049, Appendix B: Audiometric test rooms; and

(iv) Records of audiometer calibrations required by WAC 296-62-09029(5).

(d) Inform each employee of the results of his/her audiometric test and whether or not there has been a hearing level decrease or improvement since his/her previous test.

(8) **Follow-up procedures.** If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift, the employer shall ensure that the following steps are taken:

(a) Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.

(b) Employees already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation if necessary.

(c) Inform the employee in writing, within 21 days of the determination, of the existence of a standard threshold shift;

(d) Refer the employee, at no cost to the employee, for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if the employer suspects that a medical pathology of the ear (as defined in WAC 296-62-09017) is caused or aggravated by the wearing of hearing protectors; and

(e) Inform the employee of the need for an otological examination if a medical pathology of the ear which is unrelated to the use of hearing protectors is suspected.

(9) **Revised baseline.** An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist or other qualified physician who is evaluating the audiogram:

(a) The standard threshold shift revealed by the audiogram is persistent; or

(b) The hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09027, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09027, filed 1/15/82.]

WAC 296-62-09029 Audiometric test requirements.

(1) Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including as a minimum 500, 1000, 2000, 3000, 4000, and 6000 Hz. Tests at each frequency shall be taken separately for each ear.

(2) Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, American National Standard Specification for Audiometers, S3.6-1969(R1973).

WAC 296-62-09029 (Cont.)

(3) Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in WAC 296-62-09047, Appendix A: Audiometric measuring instruments.

(4) Audiometric examinations shall be administered in a room meeting the requirements listed in WAC 296-62-09049, Appendix B: Audiometric test rooms.

(5) **Audiometer calibration.**

(a) The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds. Deviations of 10 dB or greater shall require an acoustic calibration.

(b) Audiometer calibration shall be checked acoustically at least annually in accordance with WAC 296-62-09051, Appendix C: Acoustic calibration of audiometers. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check.

(c) An exhaustive calibration shall be performed at least every two years in accordance with sections 4.1.2; 4.1.3; 4.1.4.3; 4.2; 4.4.1; 4.4.2; 4.4.3; and 4.5 of the American National Standard Specification for Audiometers, S3.6-1969(R1973). Test frequencies below 500 Hz and above 6000 Hz may be omitted from the calibration.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09029, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09029, filed 1/15/82.]

WAC 296-62-09031 Hearing protectors.

(1) Employers shall make hearing protectors available to all employees exposed to a time-weighted average of 85 dBA or greater at no cost to the employees. Hearing protectors shall be replaced as necessary.

(2) Employers shall ensure that hearing protectors are worn:

(a) By any employee who is exposed to an 8-hour time-weighted average of 85 dBA or greater; or

(b) By any employee who is exposed to noise above 115 dBA; or

(c) By any employee who is exposed to any impulsive or impact noise measured at or above 140 dB peak using an impulse sound level meter set to either the linear or C-scale.

(3) Employees shall be given the opportunity to select their hearing protectors from at least two different types (i.e. molded, self-molded, custom molded, or ear muffs) of suitable hearing protectors provided by the employer.

(4) The employer shall provide training in the use and care of all hearing protectors provided to employees.

(5) The employer shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09031, filed 11/30/83; 82-13-045 (Order 82-22), 296-62-09031, filed 6/11/82; 82-03-023 (Order 82-1), 296-62-09031, filed 1/15/82.]

WAC 296-62-09033 Hearing protector attenuation.

(1) The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used by one of the methods described in WAC 296-62-09053, Appendix D: Methods for estimating the adequacy of hearing protector attenuation, or by other methods if approved by the director.

WAC 296-62-09033 (Cont.)

(2) Hearing protectors must attenuate employee exposure at least to a time-weighted average of 85 dBA or below.

(3) The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. The employer shall provide more effective hearing protectors where necessary.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09033, filed 11/30/83; 82-13-045 (Order 82-22), 296-62-09033, filed 6/11/82; 82-03-023 (Order 82-1), 296-62-09033, filed 1/15/82.]

WAC 296-62-09035 Training program.

(1) The employer shall institute a training program for all employees who are exposed to noise at or above an 8-hour time-weighted average of 85 dBA, and shall ensure employee participation in such program.

(2) The training program shall be repeated annually for each employee included in the hearing conservation program. Information provided in the training program shall be updated to be consistent with changes in protective equipment and work processes.

(3) The employer shall ensure that each employee is informed of the following:

(a) The effects of noise on hearing;

(b) The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care; and

(c) The purpose of audiometric testing, and an explanation of the test procedures.

(d) The right to access to records as specified in WAC 296-62-09041(5).

(4) A written description of the training program instituted shall be maintained by each employer.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09035, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09035, filed 1/15/82.]

WAC 296-62-09037 Access to information and training materials.

(1) The employer shall make available to affected employees or their representatives copies of this standard and shall also post a copy in the workplace.

(2) The employer shall provide to affected employees any informational materials pertaining to this standard that are supplied to the employer by the director.

(3) The employer shall provide, upon request, all materials related to the employer's training and education program pertaining to this standard to the director.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), 296-62-09037, filed 1/15/82.]

WAC 296-62-09039 Warning signs.

(1) Signs shall be posted at entrances to or on the periphery of all well defined work areas in which employees may be exposed at or above 115 dBA.

(2) Warning signs shall clearly indicate that the area is a high noise area and that hearing protectors are required.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09039, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09039, filed 1/15/82.]

WAC 296-62-09041 Recordkeeping.

(1) **Exposure measurements.** The employer shall maintain an accurate record of all employee exposure measurements required by this section.

(2) **Audiometric tests.**

(a) The employer shall retain a legible copy of all employee audiograms obtained pursuant to WAC 296-62-09027.

(b) This record shall include:

(i) Name and job classification of the employee;

(ii) Date of the audiogram;

(iii) The examiner's name;

(iv) Date of the last acoustic or exhaustive calibration of the audiometer; and

(v) Employee's most recent noise exposure assessment.

(3) **Audiometric test rooms.** The employer shall maintain accurate records of the measurements of the background sound pressure levels in audiometric test rooms.

(4) **Record retention.** The employer shall retain records required in this section for at least the following periods:

(a) Noise exposure measurement records shall be retained for two years.

(b) Audiometric test records shall be retained for the duration of the affected employee's employment.

(5) **Access to records.** All records required by this section shall be provided upon request to employees, former employees, representatives designated by the individual employee, and the director. The provisions of WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217 apply to access to records under this section.

(6) **Transfer of records.** If the employer ceases to do business, the employer shall transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period prescribed in WAC 296-62-09041(4).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09041, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09041, filed 1/15/82.]

WAC 296-62-09043 Appendices. WAC 296-62-09047, 296-62-09049, 296-62-09051, and 296-62-09053 and 296-62-09055, Appendices A, B, C, D, and E are incorporated as part of this section and the contents of these appendices are mandatory.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09043, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09043, filed 1/15/82.]

WAC 296-62-09045 Effective dates.

(1) WAC 296-62-09015 through 296-62-09053 shall become effective 60 days after filing with the code reviser, unless otherwise noted below.

(2) Monitoring conducted pursuant to WAC 296-62-09019 shall be completed no later than 180 days from the effective date of the standard.

WAC 296-62-09045 (Cont.)

(3) Baseline audiograms required by WAC 296-62-09027 shall be completed no later than December 31, 1982.
[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), 296-62-09045, filed 1/15/82.]

WAC 296-62-09047 Appendix A--Audiometric measuring instruments.

(1) In the event that pulsed-tone audiometers are used, they shall have a tone on-time of at least 200 milliseconds.

(2) Self-recording audiometers shall comply with the following requirements:

(a) The chart upon which the audiogram is traced shall have lines at positions corresponding to all multiples of 10 dB hearing level within the intensity range spanned by the audiometer. The lines shall be equally spaced and shall be separated by at least 1/4 inch. Additional increments are optional. The audiogram pen tracings shall not exceed 2 dB in width.

(b) It shall be possible to set the stylus manually at the 10dB increment lines for calibration purposes.

(c) The slewing rate for the audiometer attenuator shall not be more than 6 dB/sec except that an initial slewing rate greater than 6 dB/sec is permitted at the beginning of each new test frequency, but only until the second subject response.

(d) The audiometer shall remain at each required test frequency for 30 seconds (±3 seconds). The audiogram shall be clearly marked at each change of frequency and the actual frequency change of the audiometer shall not deviate from the frequency boundaries marked on the audiogram by more than ±3 seconds.

(e) It must be possible at each test frequency to place a horizontal line segment parallel to the time axis on the audiogram, such that the audiometric tracing crosses the line segment at least six times at the test frequency. At each test frequency the threshold shall be the average of the midpoints of the tracing excursions.
[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09047, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09047, filed 1/15/82.]

WAC 296-62-09049 Appendix B--Audiometric test rooms. Rooms used for audiometric testing shall not have background sound pressure levels exceeding those in Table B-1 when measured by equipment conforming at least to the Type 2 requirements of American National Standard Specification for Sound Level Meters, S1.4-1971 (R1976), and to the Class II requirements of American National Standard Specification for Octave, Half-Octave, and Third-Octave Band Filter Sets, S1.11-1971 (R1976).

TABLE B-1

Maximum Allowable Octave Band Sound Pressure Levels for Audiometric Test Rooms

Octave band center Frequency (Hz)	500	1000	2000	4000	8000
Sound pressure level (dB)	40	40	47	57	62

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), 296-62-09049, filed 1/15/82.]

WAC 296-62-09051 Appendix C--Acoustic calibration of audiometers. Audiometer calibration shall be checked acoustically, at least annually, according to the procedures described in this Appendix. The equipment necessary to perform these measurements is a sound level meter, octave-band filter set, and a National Bureau of Standards 9A coupler. In making these measurements, the accuracy of the calibrating equipment shall be sufficient to determine that the audiometer is within the tolerance permitted by American National Standard Specifications for Audiometers, S3.6-1969(R1973).

(1) **Sound pressure output check.**

(a) Place the earphone coupler over the microphone of the sound level meter and place the earphone on the coupler.

(b) Set the audiometer's hearing threshold level (HTL) dial to 70 dB.

(c) Measure the sound pressure level of the tones at each test frequency from 500 Hz through 6000 Hz for each earphone.

(d) At each frequency the readout on the sound level meter should correspond to the levels in Table C-1 or Table C-2, as appropriate, for the type of earphone, in the column entitled “sound level meter reading.”

(2) **Linearity check.**

(a) With the earphone in place, set the frequency to 1000 Hz and the HTL dial on the audiometer to 70 dB.

(b) Measure the sound levels in the coupler at each 10dB decrement from 70 dB to 10 dB, noting the sound level meter reading at each setting.

(c) For each 10dB decrement on the audiometer the sound level meter should indicate a corresponding 10 dB decrease.

(d) This measurement may be made electrically with a voltmeter connected to the earphone terminals.

(3) **Tolerances.**

When any of the measured sound levels deviate from the levels in Table C-1 or Table C-2 by ±3 dB at any test frequency between 500 and 3000 Hz, 4 dB at 4000 Hz, or 5 dB at 6000 Hz, an exhaustive calibration is required.

Table C-1

Reference threshold levels for telephonics - TDH 39 earphones

Frequency, Hz	Reference Threshold level For TDH-39 Earphones , dB	Sound level Meter reading, dB
500	11.5	81.5
1000	7	77
2000	9	79
3000	10	80
4000	9.5	79.5
6000	15.5	85.5

WAC 296-62-09051 (Cont.)

Table C-2		
Reference threshold levels for telephonics - TDH 49 earphones		
Frequency, Hz	**Reference Threshold level For TDH-49 Earphones, dB**	**Sound level Meter reading, dB**
500	13.5	83.5
1000	7.5	77.5
2000	11	81.0
3000	9.5	79.5
4000	10.5	80.5
6000	13.5	83.5

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09051, filed 11/30/83; 82-13-045 (Order 82-22), 296-62-09051, filed 6/11/82; 82-03-023 (Order 82-1), 296-62-09051, filed 1/15/82.]

WAC 296-62-09053 Appendix D--Methods for estimating the adequacy of hearing protector attenuation.

(1) Hearing protector attenuation must be sufficient to reduce employee exposure to a TWA of 85 dBA.

(2) The most convenient method to use is the noise reduction rating (NRR) developed by the Environmental Protection Agency (EPA). According to EPA regulation, the NRR must be shown on the hearing protector package. The NRR is then related to an individual worker's noise environment in order to assess the adequacy of the attenuation of a given hearing protector. This appendix describes two methods of using the NRR to determine whether a particular hearing protector provides adequate protection within a given exposure environment. Selection between the two procedures is dependent upon the employer's noise measuring instruments.

(3) When using the NRR to assess hearing protector adequacy, one of the following methods must be used:

(a) When using a dosimeter that is capable of making A-weighted measurements:

(i) Convert the A-weighted dose to TWA.

(ii) Subtract 7 dB from the NRR.

(iii) Subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(b) When using a sound level meter set to the A-weighting network:

(i) Obtain the employee's A-weighted TWA.

(ii) Subtract 7 dB from the NRR, and subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(4) Other methods may be utilized if they are at least as effective as the NRR if approved by the director.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09053, filed 11/30/83; 82-03-023 (Order 82-1), 296-62-09053, filed 1/15/82.]

WAC 296-62-09055 Appendix E--Noise exposure computation.

(1) **Computation of employee noise exposure.**

(a) Noise dose is computed using Table E-1 as follows:

(i) When the sound level, L, is constant over the entire work shift, the noise dose, D, in percent, is given by: D=100 C/T where C is the total length of the work day, in hours, and T is the reference duration corresponding to the measured sound level, L, as given in Table E-1 or by the formula shown as a footnote to that table.

(ii) When the workshift noise exposure is composed of two or more periods of noise at different levels, the total noise dose over the work day is given by: $D=100(C_1/T_1+C_2/T_2+...+C_nT_n)$, where C_n indicates the total time of exposure at a specific noise level, and Tn indicates the reference duration for that level as given by Table E-1.

(b) The 8-hour time-weighted average sound level (TWA), in decibels, may be computed from the dose, in percent, by means of the formula: $TWA = 16.61 \log_{10}(D/100)+90$. For an 8-hour workshift with the noise level constant over the entire shift, the TWA is equal to the measured sound level.

(c) A table relating dose and TWA is given in subsection (2) of this section.

Table E-1

A weighted sound level, L (decibel)	Reference duration T (hour)
80	32
81	27.9
82	24.3
83	21.1
84	18.4
85	16
86	13.9
87	12.1
88	10.6
89	9.2
90	8
91	7.0
92	6.2
93	5.3
94	4.6
95	4
96	3.5
97	3.0
98	2.6
99	2.3
100	2
101	1.7
102	1.5
103	1.4
104	1.3

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Table E-1 (Cont.)	
A weighted sound level, L (decibel)	**Reference duration T (hour)**
105	1
106	0.87
107	0.76
108	0.66
109	0.57
110	0.5
111	0.44
112	0.38
113	0.33
114	0.29
115	0.25
116	0.22
117	0.19
118	0.16
119	0.14
120	0.125
121	0.11
122	0.095
123	0.082
124	0.072
125	0.063
126	0.054
127	0.047
128	0.041
129	0.036
130	0.031

In the above table the reference duration T, is computed by

$$T = \frac{8}{2^{(L-90)/5}}$$

where L is the measured A-weighted sound level.

(2) **Conversion between "dose" and "8-hour time-weighted average" sound level.**

(a) Compliance with WAC 296-62-09015 through 296-62-09055 of this regulation is determined by the amount of exposure to noise in the workplace. The amount of such exposure is usually measured with an audiodosimeter which gives a readout in terms of "dose." In order to better understand the requirements of these standards, dosimeter readings can be converted to an "8-hour time-weighted average (TWA) sound level."

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(b) In order to convert the reading of a dosimeter into TWA, see Table E-2. This table applies to dosimeters that are set by the manufacturer to calculate dose or percent exposure according to the relationships in Table E-1. So, for example, a dose of 91 percent over an eight-hour day results in a TWA of 89.3 dB, and a dose of 50 percent corresponds to a TWA of 85 dB.

(c) If the dose as read on the dosimeter is less than or greater than the values found in Table E-2, the TWA may be calculated by using the formula: TWA = 16.61 log10 (D/100) + 90 where TWA = 8-hour time-weighted average sound level and D = accumulated dose in percent exposure.

Table E-2

Conversion from "percent noise exposure" or "dose" To "8-hour time weighted average sound level" (TWA)

Dose or percent noise exposure	TWA (dBA)
10	73.4
15	76.3
20	78.4
25	80.0
30	81.3
35	82.4
40	83.2
45	84.2
50	85.0
55	85.7
60	86.3
65	86.9
70	87.4
75	87.9
80	88.4
81	88.5
82	88.6
83	88.7
84	88.7
85	88.8
86	88.9
87	89.0
88	89.1
89	89.2
90	89.2
91	89.3
92	89.4
93	89.5
94	89.6
95	89.6
96	89.7
97	89.8
98	89.9
99	89.9
100	90.0
101	90.1
102	90.1
103	90.2

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Table E-2 (Cont.)	
Conversion from "percent noise exposure" or "dose" To "8-hour time weighted average sound level" (TWA)	
Dose or percent noise exposure	**TWA (dBA)**
104	90.3
105	90.4
106	90.4
107	90.5
108	90.6
109	90.6
110	90.7
111	90.8
112	90.8
113	90.9
114	90.9
115	91.1
116	91.1
117	91.1
118	91.2
119	91.3
120	91.3
125	91.6
130	91.9
135	92.2
140	92.4
145	92.7
150	92.9
155	93.2
160	93.4
165	93.6
170	93.8
175	94.0
180	94.2
185	94.4
190	94.6
195	94.8
200	95.0
210	95.4
220	95.7
230	96.0
240	96.3
250	96.6
260	96.9
270	97.2
280	97.4
290	97.7
300	97.9
310	98.2
320	98.4
330	98.6
340	98.8

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Table E-2 (Cont.)	
Conversion from "percent noise exposure" or "dose" To "8-hour time weighted average sound level" (TWA)	
Dose or percent noise exposure	**TWA (dBA)**
350	99.0
360	99.2
370	99.4
380	99.6
390	99.8
400	100.0
410	100.2
420	100.4
430	100.5
440	100.7
450	100.8
460	101.0
470	101.2
480	101.3
490	101.5
500	101.6
510	101.8
520	101.9
530	102.0
540	102.2
550	102.3
560	102.4
570	102.6
580	102.7
590	102.8
600	102.9
610	103.0
620	103.2
630	103.3
640	103.4
650	103.5
660	103.6
670	103.7
680	103.8
690	103.9
700	104.0
710	104.1
720	104.2
730	104.3
740	104.4
750	104.5
760	104.6
770	104.7
780	104.8
790	104.9
800	105.0
810	105.1

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Table E-2 (Cont.)	
Conversion from "percent noise exposure" or "dose" To "8-hour time weighted average sound level" (TWA)	
Dose or percent noise exposure	**TWA (dBA)**
820	105.2
830	105.3
840	105.4
850	105.4
860	105.5
870	105.6
880	105.7
890	105.8
900	105.8
910	105.9
920	106.0
930	106.1
940	106.2
950	106.2
960	106.3
970	106.4
980	106.5
990	106.5
999	106.6

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), 296-62-09055, filed 11/30/83.]